

IN THE CLAIMS:

The following listing of claims will replace all prior listings of claims in the application:

1. (Currently Amended): A dedicated, hardware-based Physics Processing Unit (PPU), comprising:

a vector processor adapted to perform multiple, parallel floating point operations to generate physics data, wherein the multiple, parallel floating point operations are specified by a very long instruction word (VLIW) that is issues to the vector processor; and

a data communication circuit adapted to communicate the physics data to a host Central Processing Unit (CPU).

2. (Currently Amended): The PPU of claim 1, wherein ~~the host comprises a Central Processing Unit (CPU)~~, and the PPU further comprises:

a PPU Control Engine (PCE) receiving commands from the CPU and controlling communication the physics data from the PPU to the host.

3. (Original): The PPU of claim 2, wherein the PPU further comprises:

an external memory and an internal memory; and

a Data Movement Engine (DME) controlling the movement of data between the external memory and the internal memory in response to instructions received from the PCE.

4. (Original): The PPU of claim 3, further comprising:

a Floating Point Engine (FPE) performing multiple, parallel floating point operations on data stored in the internal memory.

5. (Original): The PPU of claim 4, wherein the internal memory is operatively connected to the DME, and further comprising:

a high-speed memory bus operatively connecting an external high-speed memory to at least one of the DME and the FPE.

6. (Original): The PPU of claim 5, wherein the internal memory comprises multiple banks allowing multiple data threading operations.
7. (Original): The PPU of claim 3, wherein the PCE comprises control and communication software stored in a RISC core.
8. (Original): The PPU of claim 5, wherein the internal memory comprises first and second banks, and wherein the DME further comprises:
- a first unidirectional crossbar connected to the first bank;
 - a second unidirectional crossbar connected to the second bank; and,
 - a bi-directional crossbar connecting first and second crossbars to the external high-speed memory.
9. (Currently Amended): ~~A dedicated, hardware-based Physics Processing Unit (PPU) connected within a system, to a Central Processing Unit (CPU) and~~ comprising:
- a Central Processing Unit (CPU);
 - an external memory storing data; and,
 - a dedicated, hardware-based Physics Processing Unit (PPU) connected to the CPU and comprising an Application Specific Integrated Circuit (ASIC) implementing a vector processor adapted to perform multiple, floating point operations, wherein the multiple, parallel floating point operations are specified by a very long instruction word (VLIW) that is issues to the vector processor; and
 - an external memory storing data, wherein the external memory is communicatively coupled to the PPU.
10. (Currently Amended): The PPU system of claim 9, ~~wherein the system comprises further comprising~~ a Personal Computer (PC); and wherein the PPU comprises an expansion board adapted for incorporation within the PC, the expansion board mounting the ASIC and the external memory.

11. (Currently Amended): The PPU system of claim 10, further comprising circuitry enabling at least one data communications protocol between the PPU and CPU.
12. (Currently Amended): The PPU system of claim 11, wherein the at least one data communications protocol comprises at least one protocol selected from a group of protocols defined by USB, USB2, Firewire, PCI, PCI-X, PCI-Express, and Ethernet.
13. (Currently Amended): The PPU system of claim 11, wherein the ASIC comprises a PPU Control Engine (PCE) receiving commands from the CPU and controlling data communications between the PPU and PC.
14. (Currently Amended): The PPU system of claim 13, wherein the ASIC further comprises:
- an internal memory; and
 - a Data Movement Engine (DME) controlling the movement of data between the external memory and the internal memory in response to instructions received from the PCE.
15. (Currently Amended): The PPU system of claim 14, further comprising:
- a Floating Point Engine (FPE) performing multiple, parallel floating point operations on data stored in the internal memory.
16. (Currently Amended): The PPU system of claim 15, wherein the internal memory is operatively connected to the DME, and further comprising:
- a high-speed memory bus operatively connecting the external memory to at least one of the DME and the FPE.

17. (Currently Amended): The PPU system of claim 16, wherein the internal memory comprises multiple banks allowing multiple data threading operations.
18. (Currently Amended): The PPU system of claim 17, wherein the internal memory further comprises:
an Inter-Engine memory transferring data between the DME and FPE.
19. (Currently Amended): The PPU system of claim 18, wherein the internal memory further comprises:
a Scratch Pad memory.
20. (Currently Amended): The PPU system of claim 14, further comprising a command packet queue transferring command packets from the PCE to the DME.
21. (Currently Amended): The PPU system of claim 15, wherein the FPE comprises a plurality of Vector Floating-point Units.
22. (Currently Amended): The PPU system of claim 21, wherein at least one of the command packets defines a vector length of variable length.
23. (Currently Amended): The PPU system of claim 15, wherein the DME comprises a plurality of Memory Control Units (MCUs) and a Switch Fabric connecting the MCUs to the external memory; and,
wherein the FPE comprises a plurality of Vector Processing Engines (VPEs) receiving data from at least one of the MCUs via a VPE bus.
24. (Currently Amended): The PPU system of claim 23, wherein each Vector Processing Engine (VPE) comprises a plurality of Vector Processing Units (VPUs) receiving data from the VPE bus.

25. (Currently Amended): The PPU system of claim 24, wherein each VPU comprises:
- a dual bank[[.]] Inter-Engine Memory (IEM) receiving data from the VPE bus;
 - one or more data registers receiving data from the IEM under the control of an associated Load/Store Unit; and
 - an Execution Unit performing parallel floating point operations.
26. (Currently Amended): The PPU system of claim 23, wherein at least one command packet received from the PCE defines a vector length of variable length.
27. (Currently Amended): The PPU system of claim 23, wherein the Switch Fabric comprises at least one crossbar circuit.
28. (Currently Amended): The PPU system of claim 24, wherein each VPU is dynamically re-configurable.